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Geographic Data on the Lower Volga Region

- Source I: Spravochnik po vodnym resursam SSR (Handbook on Water Resources), Vol V, "Nizhneye Povolsh'ye (Lower Volga Region), 1934 -
- Source III: Karta rastitel'nosti Yevropeyskoy chasti SSSR, Poyasnitel'nyy tekst, (Map of vegetation of the European Part of the USSR, explanatory text), 1950 .

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TEMPERATURE CONDITIONS

A considerable body of material has been used to characterize temperature conditions, which includes the observation of 34 stations within the limits of the described territory and a still greater number of stations located in its immediate surroundings. Below are cited the monthly and annual average and extremes of temperature for the 34 stations of the territory. Of these the duration of observation for 3 stations does not exceed 5 years, 7 stations from 6 to 15 years, 13 stations from 35 to 40 years. Thus, 24 stations, or 70 percent of the total number, provide data exceeding 16 years' observation. The data in the table for the averages is obtained from a 40 year period -- from 1891 to 1930.

The stations are arranged in columns through 2 degrees longitude-- from north to south. The limits of temperature are given only for stations with more prolonged periods of observation. In the northern part they are arranged more densely. The desert south is poorly illuminated. But here, as a consequence of the weakening influence of the sea, the temperature regime is considerably less marked, as may be seen from a comparison of extreme amplitudes, which reach up to 85 degrees in the central parts of the country and drop to 64 degrees for the maritime stations.

Annual average temperatures vary within the limits of 2.7 degrees (Polibino) to 9.3 degrees (Astrakhan'). With respect to this, there must be taken into consideration not only a difference of 7 degrees 20 minutes in latitude, but also a 200 meter difference in elevation. Assuming a rise in temperature for every 100 meters to equal about 0.5 degrees, we have a change in temperature of 5.6 degrees when going from Polibino to Astrakhan', which may be considered to be small. Considerably more acute is the difference of local conditions in comparing the average monthly temperatures for January and July. The following are the limiting magnitudes of these temperatures:

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January	Polibino	14.5 degrees	Astrakhan'	6.8 degrees
July	Polibino	19.7 degrees	Astrakhan'	25.1 degrees

Through reduction to the same elevation, the difference became respectively 6.7 degrees for January and 4.4 degrees for July, showing an equalization of summer temperatures and, conversely, an accentuation of differences for winter temperatures, — symptomatic of an increasing continental influence. This singularity is even more emphasized by comparing the figures contained in the fourth and fifth columns of the table. The lowest individual temperatures for January are: Novouzensk, -44.5 degrees; Chetyrekbugornyy Kayak, -27.6 degrees; thereby giving a difference of 17 degrees.

The highest temperatures vary from 41.2 degrees at Valyy Uzen' to 35.5 degrees at Oranzheroznyy Promysel, a difference of 5.7 degrees. But it should be noted that the latter magnitude is somewhat smaller with respect to the preceding, because the observations on the basis of which it was obtained were standard and did not take into consideration the limits of increase in temperature. In any case, all the data goes to show that the particularly greatest heating and the greatest cooling are to be sought in the middle part of the territory under consideration, and not in its northern and southern limits. They also show that the amplitudes of annual variation are great, reaching 86 degrees, and, no doubt, even higher within the limits of the steppe, while in the north they decrease to 74 degrees, and in the extreme south, on the shore of the sea, to 64 degrees. On the background formed by those large variations of geographical order, indicating a strong influence of continental climate, there could also be noted a number of local singularities to be explained by purely local reasons — such as whether a station is located in a valley or on a slope, etc.

A table and a number of maps are given below to show the annual range of temperature, indicating the onset of individual phases and the

SECRET

- 2 -

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duration of the seasons - warm and cold.

The earliest transition through 0 degrees is first observed on the Caspian Sea, on the southwestern boundary of the territory (on the 70th day from the beginning of the year or 11 March). Twenty-seven days are required for the spreading of spring throughout the entire region, 20 days being needed for having it spread from the sea to Malyy Uzun' and Novouzensk, while only 7 days are required further on in the northeast. The onset of the winter season almost duplicates what has been mentioned, with the difference that the contrast between the northwestern and southwestern halves is somewhat smaller. In the northeast, autumn ends on the 300th day, and in Novouzensk on the 310th day. It is interesting to note that it takes the air to cool at the end of the warm season 50 percent more time in the fall in the northern half of the region under observation, and 70 percent more time in the southern half, than it takes to correspondingly warm the air in the spring. There is an almost perfect correspondence existing in the drawing of corresponding isochronous lines for the beginning and end of the warm season, with the difference, of course, that the movement is in different directions; the first time from southwest to northeast, the second time in reverse.

There should be noted the repetition on both maps of isochronic lines between Saratov and Syzran' (indicated by the 6th and 7th dotted lines on the maps). They assume for the given sector a completely contradictory direction with respect to the other lines on the Volga running from southwest to northeast along the valley of Tereshka River, having in place of the latitudinous direction of the preceding lines, more southern isochronic lines. It is obvious that the elevations of the upper reaches of the Gura and Barysh exert a disturbing influence on the thermal regime of this area. (For this region and the somewhat more northern area, there has been expressed in literature a belief in the unreliability of the data obtained from the stations at Ablyazovo, Annenkovo, etc.

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At the present time it stated that the reason for the negative deviations in this area is to be sought in its topography, high elevation, and sharp relief. On the watershed of the Gura, Dymna, and Terezhka rivers, there is a sharply delineated elevated group, indicated on the corresponding maps. Near it are to be found all deviations with respect to temperature and precipitation.

TABLE 2

Name of Station	Number of Observations	Average Temperature in Degrees		Lowest Absolute Tem- perature in Degrees	Highest Average Tem- perature in Degrees	Amplitude of Monthly Average Temperatures	Amplitude of Extreme Temperatures
		Year	Jan July				
Kamyshin							
Stalingrad							
Tinguta							
Vol'sk							
Saratov							
Urbakh							
Kalyuzhsk							
Kostychevaya Op. Pole							
El'ton							
Urda							
Akhtuba							
Raskunchak							
Khosheutovskiy Uchastok							
Oranzheroynyy Promysel							
Bozsta							
Biryuch'ya Kosa							
Chetyrekhbugornyy Mayak							

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SECRETTABLE 2 (continued)

Name of Station	Number of Observations	Average Temperature In Degrees			Lowest Absolute Tempera- ture in Degrees	Highest Average Temper- ature in Degrees	Amplitude of Monthly Average Temperatures	Amplitude of Extreme Temperatures
		Year	Jan.	July				
Ul'yanovsk								
Syzran'								
Bezencluk								
Kamyshinskiy Khutor								
Kochetkovo								
Yershov								
Novouzensk								
Bekmalchamodova Stavka								
Astrakhan'								
Timashevo								
Kinel'								
Tonnshev Kolok								
Yekaterinovka								
Polibino								
Buguruslan								
Borovoye Lesnichestvo								
Buzuluk								

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SECRET**TABLE 3**

Name of Station	Time (in days) of Transi- tion for Average Tempera- tures from the beginning of the year				Duration of Seasons (in days) with Average Tem- peratures		
	0°	10°	10°	more than 0°	More than 0°	From 0° To 10°	From 10° To 0°

Kamyshin

Stalingrad

Tinguta

Vol'sk

Saratov

Urbakh

Malyi Uzun'

Kostychevaya Op. Pole

El'ton

Urda

Akhtuba

Baskunchak

Khosheutovskiy Uchastok

Oranzhereynyy Promysel

Roasta

Piryuch'ya Kosa

Chetyrekhbugornyy Mayak

Ul'yanovsk

Syzran'

Bezenchuk

Kamyshinskiy Khutor

Kochetkovo

Yershov

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- 6 -

SECRETTABLE 3 (continued)

Name of Station	Time (in days) of Transi- tion for Average Tempera- tures from the beginning of the year				Duration of Seasons (in days) with Average Tem- peratures	
	0°	10°	10°	More than 0°	More than 0° From 0° To 10°	From 10° To 0°

Novosonok

Bekmukhamadova Stavka

Astrakhan'

Tinnoshevo

Kinel'

Tomashov Kolok

Yekaterinovka

Polibino

Bagumslan

Dorovoye Leonichestvo

Buzuluk

Map 2 relating to the duration of the warm season is derived from the two preceding maps and for this reason it is perfectly natural for it to show the rather detailed results just indicated of the influence of the Volga elevation. The growth in the length of summer in the area from Samarskaya Luka to Saratov is considerably slower along the right bank than along the left. This influence is to be felt on the left bank between the Irgis and Karaman rivers. It is difficult to attribute this cooling to anything else but the influence of cold air currents from the Volga elevations at the main Volga-Don waterdivide.

The duration of the warm season, or the number of days with an average temperature above 0 degrees, as shown on Map 2, determines that part of the year when precipitation runs off in liquid form without any delay. The duration of the sea-

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the east, the ground and air warm up and hold their heat longer in the wooded trans-Volga area. A reverse relationship is to be noted in the next sector where woods are few. Finally, in the last sector, the change of seasons takes place on the right bank as follows: northern part -- 6 April to 26 October, middle part -- 31 March to 6 November, and southern part -- 11 March to 12 December.

Relative to this, the duration of the warm season varies from 203 to 276 days, and the duration of the cold from 89 to 162 days. The differences in range, obviously, are tremendous, inasmuch as the length of the cold period decreases for an entire one-third of a year in going from south to north, to the shore of the sea. This doubtless reflected to the same extent on the river regime as on the climatic regime of the territory.

No less characteristic are the transitional phases of the annual range of temperature. With respect to them, pertinent data are to be found in Table 3. These phases are determined by the time that the temperature crosses 10 degrees, both in the first and second halves.

Spring may be considered to be that period when the temperature remains within the limits of 0 degrees to 10 degrees, and autumn, when the temperature drops from 10 degrees to 0 degrees. In such a case, to spring may be allotted 27 to 40 days, while to autumn 40 to 51 days. In other words, spring is on the average 11 days shorter than autumn. The process of spring enveloping the whole region is slower than the autumn cooling and preparation for the cold period. Both spring and autumn are protracted considerably along the sea coast, but the prolongation here is much less than for the shores of other seas, such as the Black Sea, or even the White Sea, where spring and autumn last as long as 80 days. The continental character of the whole region and ice covering the north part of the Caspian area serve as reason for this.

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- 9 -

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It would be helpful to include the following few figures to characterize the variability of temperatures in their perennial procession.

There was computed for three stations with long-period observations (35 to 40 years) the average variability of average monthly temperatures, i.e., the mean was taken for all deviations, regardless of its sign, then there is given the magnitudes of the limits of deviation to this or that side, and finally, there is given an absolute variability, i.e., the amplitude of the extreme deviations, in degrees in all cases.

SECRET

- 10 -

11

SECRETTABLE 4

Month	Average Variability in Degrees			Limits of Deviation in Degrees						Absolute Variability in Degrees		
	Saratov	Malyy Uzen'	Astrakhan'	Saratov		Malyy Uzen'		Astrakhan'		Saratov	Malyy Uzen'	Astrakhan'
				+	-	+	-	+	-			
January												
February												
March												
April												
May												
June												
July												
August												
September												
October												
November												
December												
Annual												

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The bottom line gives the annual average temperatures, rather than the mean variability for monthly magnitudes.

As is to be seen from the table, the variability of data throughout the entire region is relatively high. The highest magnitudes, for all stations, as one would expect, are found to prevail during the winter months from January to March, where in the highest belongs to a steppe station, Malyy Uzen', where average variability attains 3.3 degrees. In summer, there is generally less variability, being particularly small at Astrakhan', dropping down to 0.7 degrees, i.e., five times smaller than that noted for Malyy Uzen'. Thus, the temperatures for individual months may deviate from the norm of the winter average up to 9.5 degrees. In summer these deviations are generally 3 to 4 times smaller than the winter ones. Even for annual averages they are large, being possible up to 2 degrees. Under such fluctuations of temperature the climate for the entire region must be considered to be wholly continental. The proximity of the sea, without a doubt, mitigates the severity of the climate, but for only a short distance. A comparison of Astrakhan' with Malyy Uzen' clearly demonstrates that a mitigation of fluctuation does not spread to the area of the Uzen' rivers. There it is only to be noted in the summer, and then insignificantly. During the winter, on the other hand, the middle part of the region, and probably for a distance considerably south of the Uzen' rivers, there are to be noted extreme fluctuations ranging up to 10 degrees on either side. Let us briefly note those temperature limits that have been observed up to now: -44.5 degrees and +41.2 degrees. These are to be observed in the region of the Uzen' rivers.

SECRET

- 12 -

100

SECRETPrecipitation

This element, most important from a hydrological point of view, is discussed in greater detail in Chapter 4 of this book. Here are given only general conclusions based on the data of many years from 132 stations of the basin under consideration (besides the many stations in areas adjacent to the basin). These stations are scattered widely, and unevenly. The more populated northern part of Mikhneye Povolzh'ye has been studied considerably better than the southern or southeastern. The observations of stations with less than five years duration have not been used. In working a considerable number of those used, that is 33 percent, include stations with periods of observation exceeding 20 years. In the great majority of cases the stations were provided with Mifer anemids (sashchity Mifera). The material in general has been found to be reliable and satisfactory. All data is based on the 40-year period from 1891 to 1930. The results are presented in map form: (1) distribution of precipitation by average annual totals, (2) precipitation for the warm season, and (3) precipitation for the cold season.

An examination of the first of these maps (Map 9) shows that in 2-3 very limited sectors in the territory, precipitation is rather high - up to 500 millimeters (in the northwest part of the map). But such relatively well-watered areas are few. All regions with precipitation exceeding 350 millimeters are to be found in the northern part of the territory and do not cross the waterdivides of the Mochu and Samara rivers from one side, and of Irgiz from the other. One can note 3 regions with precipitation exceeding 450 millimeters. The largest of these regions is located in the upper reaches of the Cherenushan, Soka, and Kinol' rivers. A considerable part of this region of ample moisture exceeds the territorial bounds of the Mikhneye Povolzh'ye. A second spot with precipitation exceeding 450 millimeters is found at Samarskaya Luka, and, finally,

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a third is noted near, but somewhat north of, Vol'sk, in the valleys of the right-bank tributaries of the Tereshka. All three indicated regions embrace small areas.

The second place with regard to abundance of precipitation is occupied by the basins of the Kinel' and Syazan, and partly the Cheremskian in its upper reaches, the isohyets of which exceed 400 millimeters. The middle reaches of the Sok and Cheremskian fall in the region of precipitation of less than 400 millimeters. Most of the territory is considerably worse off with respect to precipitation. In the south, approximately from the line of latitude running through Samara, with rare exceptions, daily precipitation does not exceed 1 millimeter (averaged over a period of a year), with the amount of precipitation considerably dropping as one moves toward southeast (up to $\frac{1}{2}$ millimeter on the Caspian coast). This decrease in the amount of precipitation, at first, in the area of Obshchiy Syrt, is slow, but after passing the bounds of Obshchiy Syrt it speeds up and is more definite, there being noticed a number of projections with a relative increase in precipitation, partly explained by the formation of the relief in the region of the waterdivide between the Irgiz and Uzen' systems.

Thus, within the limits of the forest region, shown on Map 5 according to the climatic classification of Keppen, there should also be added an additional breakdown by sub-regions, indicating relative dryness or abundance of precipitation. Further, it cannot be considered to be completely homogenous and the "DBS b" area of the steppe is shown schematically on the map. It is further divided, in connection with new data showing a more complex distribution of precipitation, into a number of sectors of greater or lesser moisture, but encompassing only parts rather than the territory's river basins as a whole. The region of Obshchiy Syrt,

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although poorly differentiated with respect to relief, is found to be very complex with respect to its hydrological and climatic features.

In referring to the presentation of precipitation according to the period of its occurrence, by looking at Map 10, showing the distribution of precipitation for the warm period of the year, it is to be seen that the basic features of the preceding map are repeated on it. This is but natural, inasmuch as the precipitation for the warm season comprises from 65 to 80 percent of the annual total. Consequently, the characteristic features of its distribution must be clearly reflected on the annual map. Map 10 clarifies even more definitely the boundary for precipitation in excess of 250 millimeters, dividing the region of forests and forest-steppe in the north from the more warm steppe to the south of it. This boundary goes close to the southern part of Samarskaya Luka, along which there stretches eastward a zone of increased precipitation as accurately determined by the observations of a number of stations. To the north of it, is to be noticed a region with less than 300 millimeters precipitation. On the eastern boundary of this region with poor precipitation is shown a region of greater precipitation, in this case of 350 millimeters, being situated on the waterdivide of the Sok and Kinel' on one side and Sheshma and Ik on the other. To the south, in the region alternating with the elevations of the waterdivides, we have an alternation of areas of greater or lesser amplitude of precipitation of about 50 millimeters, and, finally, south of the line stretching from Saratov to Ural'sk there is to be noted a gradual diminution of precipitation in the same direction, i.e., within the limits of the non-drained Uzen' region and further down to the Caspian Sea. The region of wilderness in this case is shown by the 150-170 millimeter isohyets.

The last map of isohyets for the cold season (Map 11) is very simple. The direction of the principal isohyets on the preceding maps remains, on the whole, unchanged, but there is to be noted a number of small,

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yet worthy of mention, areas of increased winter precipitation. All of them lie along the waterdivides of the Ledveditsa and the Suru with the Volga, and are also to be found on the boundary of the waterdivides, at the short passes (perevaly) between the Irgiz and the two Uzen' rivers, and partly on the Ural waterdivide. There are a number of indications for determining their location, but the boundaries of areas with precipitation exceeding 100 millimeters cannot be considered as having been definitely established because of scarcity of data. The 50-millimeter isohyets established in former contour drawings are rather reliable.

Keeping in mind the existence of a more detailed description of precipitation in Chapter 4 of the book, it is possible to limit oneself here only to a comparison, which to a certain degree explains the genesis of precipitation in the region under discussion. For 4 stations in the northern part of the basin, and for the same number in the southern part, there was computed the amount of average daily precipitation both for the warm and the cold seasons. The results are the following: daily precipitation during the warm season is 1.51 millimeters in the north and 0.68 millimeters in the south. During the cold season it is 0.91 millimeters in the north, and 0.53 millimeters in the south.

The density of precipitation is almost twice in the north what it is in the south, where it changes very little during the course of the year, while in the north it changes considerably from one part of the year to the other. This points to the essential difference in the origin of the precipitation. The continental quality of the north is emphasized by this, while, at the same time, the influence of the Caspian Sea is emphasized by a unique precipitation of moisture solely along the littoral zone. Because of the small degree of precipitation, its influence is small and probably limited to the very small area just mentioned. Nevertheless, it should be mentioned here.

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SECRETSnow Cover

For observing snow cover we possess for the basin 24 observatories, of which 15 offer more than 10 years' observations. Besides general works with respect to snow cover, dealing with the USSR as a whole, for the territory of Makhnevo Povolzh'ye there were completed the valuable works of A. N. Karamzin [230] and N. Ye. David [292]. In Karamzin's work there are presented in great detail a number of observations by snow-measuring stations in Dugurublan Uyezd for 1906. Most interesting are his comparisons for different stations under diverse conditions and arrangements. David's work is devoted, among other things, to the treatment of data relating to snow cover for Makhnevo Povolzh'ye and, in part, the Don Basin.

In the northern part of the basin, which is more complex in relief and better provided with moisture, the number of observation points is considerably greater than in the southern part of steppe and part desert. The level character of the country in the south makes easier the observation of the distribution of snow cover, inasmuch as it falls more uniformly than in the north. In view of the fact that the southern part exists under considerably warmer conditions, the establishment of snow cover is extremely unstable here. Winters occur with little or no snow, while, at the same time, there have been a number of winters with a more or less stable snow cover. Near the sea, the instability of winters has been so marked, that it has been found necessary to refrain from drawing the limits of snow cover along the coast. For making more exact the understanding relating to the stability of snow cover, there have been established norms, according to which a snow cover is considered stable if it lies on the ground for an unbroken period of not less than 5 months.

The following data has been obtained concerning the number of winters with a stable snow cover in percentages of the total number of winters observed: Dubovka - 96 percent, Chernyy Yar - 89 percent, Krasnyy Yar - 55 percent, Bakayev Island - 33 percent, Urda - 93 percent, Tinguta -

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- 17 -

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75 percent, Oranzhneyy Promysel - 37 percent, Chetyrekhbugornyy Kayak - 20 percent, Akhtuba - 92 percent, Petropavlovsk - 67 percent, Biryuch'ya Kosa - 35 percent. Thus, the snow cover south of Krasnyy Yar must be considered as being unstable, for which reason no indications of it are to be found on the corresponding maps. Snow cover settles down in the north and northeast territory (Sosnovyy Solonets at Samarskaya Luka, Yekaterinovka and Tikhly Khutor at the upper reaches of the Lok and Kinsel') very early, on the average about 5 November. Its very late disappearance for approximately the same areas takes place around 15 April. For Akhtuba and Chernyy Yar, serving as limits for a stable cover, its appearance is noted at 15 December, while its disappearance is 15 March (for Akhtuba) and 25 February (for Chernyy Yar). Such a big difference in its time of disappearance for these two places, which are closely located with respect to each other, may be explained possibly by the poor reliability of the data for Chernyy Yar, where observations have been made for only 9 winters. The snow cover lies on the average for 161 days in the northern part and less than 90 days in the southern. The difference exceeds 70 days. A comparison with the duration of the cold season gives the following results. The duration of the cold season varies from 158 days (Polibino) to 123 days (Akhtuba) and 99 days (Oranzhneyy Promysel). Discarding the last figure, as showing only occasional winters with an unstable cover, we obtain the following results. In the north, under the forest conditions of the elevations of Obshchiy Syrt, the snow cover lies for several days longer during the transition of average temperatures across 0 degrees. In the south, on the other hand, it disappears considerably before the prescribed period for the month. This is entirely natural, inasmuch as in the first case the snow lies as an unbroken cover, while in the second, it lies as isolated splotches, which disappear considerably earlier.

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It is interesting to compare these data with the data for Mikhneye Poyelahiye as presented by R. Ye. David. Such a comparison may be made for 34 stations. The difference in determining the beginning as given in this book and as given by David is shown to be on the average 0.2 decades, wherein the data include in part various years. The end as given by David is 1.1 decades later than in this book, inasmuch as he took into consideration the last decade with snow cover, while the book has employed the average for the annals of the last decades with snow cover.

The data presented above for snow cover is in need of much correction, when one considers the magnitudes which may change considerably under the impact of local conditions. Already in its initial form, in the Annals of OGO, it is given for periods of uneven duration (from 6 to 11 days). This alone brings in a number of definite errors, besides more serious discrepancies depending upon conditions of protection, and in general on the exposition of the snow-measuring rod. A number of data concerning this problem has been borrowed from Karamzin [230]. Below is given a comparison of the duration of the snow cover for several winters, from 1893 to 1906, for two stations - Polibino and Tikhly Khutor - located 19 kilometers apart. Their elevation above sea level is 108 meters (Polibino) and 255 meters (Tikhly Khutor). The first is in a valley, the second on an elevation. The last, as a station located on a water divide, should have on the average a greater number of days with snow cover. Actually for 14 winters at Tikhly Khutor there have been 9 more such days than at Polibino, but this is only on the average. For all the 14 winters only in 10 cases have there been a greater number of days for the elevation; in two cases the duration was of the same length, while in another two cases the number of days with snow cover was greater at Polibino than on the elevation, as is shown by the following figures:

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	Polibino	Tikhly Khutor	Difference
1893	134 days	126 days	8 days
	(etc)		
	Average 154 days	163 days	-9 days

In the same author's work we find the results of a relative comparison of two stations with a double set of figures for each. At Klyuchevskiy Khutor observations were carried on at two closely located points - at a small wooded glade, about 60 meters in diameter, and in the open steppe during the winters from 1894 through 1906. At Tikhly Khutor observation from 1894 through 1906 were also carried on with two rods, one of which was placed in the steppe and the other in a wood under a covering of trees. We present the results of these observations as graphs (Drawing 1) giving by five-day periods the average heights of the snow cover for both stations located 35 kilometers apart. Moreover, it should be noted that in the given instance both stations were located on sloping elevations, with Tikhly Khutor being slightly higher than Klyuchevskiy Khutor (255 and 180 meters).

As can be seen from the chart, the accumulation of snow in the woods at the time of its highest level exceeded by 70 percent its height in the steppe, but only in average magnitudes. There was an average delay of about 5 days in the disappearance of snow cover from the wooded glade at Klyuchevskiy Khutor and one of 3 days in the solid forest at Tikhly Khutor. Furthermore, in the spring of 1897, the snow came off the ground at Klyuchevskiy Khutor 6 days later than in the steppe, and at Tikhly Khutor 20 days later. In the spring of 1904 the melting of snow in both places of observation took place identically. The woods became clear of snow only two days later than the steppe.

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Let us present, finally, the limits of variation in the height of the snow according to the observations at Polibino, Tikhly Khutor and Klyuchevskiy:

	Polibino (cm)	Tikhly Khutor (cm)	Klyuchevskiy Khutor (cm)
Winter with the greatest snow 1901-1902	56	120	109
Winter with the least snow 1899-1900	24	76	58
Average	32	64	71

All the figures, indicated above, cause one to scrutinize, with special care, those average figures which are shown on the charts of snow cover for the country with changing relief and different settings for the snow-measuring rods.

Setting aside the consideration of the details of the growth and decrease in snow cover for Chapter 4 of this book, we should still note that its subsidence in spring differs in the woods from that in the steppe. Usually the difference in the energy with which snow melts increases with respect to time. Actually the delay with respect to the snow in the forest, as indicated in the above mentioned graph, equals 4-6 days for Tikhly Khutor, while the entire process of spring subsidence continues for more than 40 days. Thus, the difference in time is relatively small. Considerably greater is the difference in the amount of snow melted. At Tikhly Khutor the snow melted in the following speeds:

	Height of Layer (cm)	Melting Time (days)	Daily Decrease (cm)
Average in the forest	84	57	1.45
Spring 1902 in the forest	120	65	1.85
Spring 1904 in the forest	99	32	3.63
Average in the steppe	48	52	0.92

212

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(continued)	Height of Layer (cm)	Melting Time (days)	Daily Decrease (cm)
Spring 1902 in the steppe	85	55	1.55
Spring 1904 in the steppe	45	30	1.52

It is evident from this how greatly different may be the conditions with respect to melting of the snow for different tempi of spring, and how great these differences may be in the forest in contrast to the steppe. Daily decrease in the forest may be greater than the decrease in the steppe from 1 to 4 times, and then, of course, the difference in the time of total disappearance of cover becomes insignificant -- from 2 to 5 days. The increase in water for the forest area is so great, that one should speak most circumspectly when referring to the retaining by the forest of spring waters. On the other hand, thanks to the considerably large accumulation of snow, the run-off of water from wooded areas should be especially big, and the receipt of these waters by the rivers for the last 2-3 days has a relatively insignificant impact on the general magnitude of the river discharge.

All the indicated difference, unfortunately, completely eludes us under the present conditions relating to the problem of snow-measuring observations. They are too small and disconnected in view of the great difference in the setting up of rods, and for this reason one should consider the data presented as a first estimate with respect to a final result.

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SECRETDrawing 1

N 1 - Klyuchevskiy Khutor 1900-01

N 2 - Tikhly Khutor 1901-02

N 3 - Tikhly Khutor 1900-01

N 4 - Tikhly Khutor, average depth

Temperature -

Forest - - - - -

Steppe - - - - -

Drawing 1: Graphs showing the annual progress for the average depth of snow cover in the forest and in the steppe on the basis of observations made at the stations at Klyuchevskiy Khutor and Tikhly Khutor. /Precedes page 33 of original/

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SECRETDeficiency of Saturation

A consideration of the deficiency of saturation for the given territory is particularly interesting inasmuch as variations in the humidity of the air within its limits are very considerable. For this reason, fairly complete data were collected and collated, both within the limits of Nizhneye Povolzh'ye, and around its borders. Thus of 33 stations, 2 stations were in operation more than 39 years, 8 stations from 20 to 35 years, 16 stations from 10 to 19 years, and, finally, 7 stations from 50 to 9 years [7 17]. All the data have been reduced to long period calculations, because it has been found that a considerable variation occurs over a period of time. A more detailed survey is to be found in Chapter 4 of this book. Only general conclusions drawn from the observations of the 23 stations within the limits of Nizhneye Povolzh'ye are given here. (Table 5).

Maps (15, 16 and 17) serve as a supplement to the table. On the basis of a preliminary general survey, it is possible to reach the conclusion that deficiency of saturation varies greatly, both for annual and seasonal averages, although in the north and on the Caspian littoral it is relatively slight, increasing considerably in the middle and eastern parts of the basin.

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SECRETTABLE 5Deficiency of Precipitation in Millimeters

No	Name of Station	Annual Averages	Cold Season	Warm Season	Highest Monthly
1	Kamyshin				
2	Stalingrad				
3	Vol'sk				
4	Saratov				
5	Malyy Uzen'				
6	Kostychevskoye Op. Pole				
7	Akhtuba				
8	Oranzheroynyy Promysel				
9	Chetyrekhbugornyy Mayak				
10	Biryuch'ya Kosa				
11	Spasskoye Op. Pole				
12	Uliyanovsk				
13	Syzran'				
14	Bezenchuk				
15	Kochetkovo				
16	Yershov				
17	Novouzensk				
18	Astrakhan'				
19	Timashevok				
20	Tomashevskiy Kolok				
21	Polibino				
22	Boroyeye Lesnichestvo				
23	Buzuluk				

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¹
(For stations with a relatively short series, the greatest magnitudes have been obtained not through direct observation, but by multiplying by 2.17 the figures for the warm season; the coefficient having been obtained as an average of the data for 16 other stations. Their coefficient varies from 2.1 to 2.8.)

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